

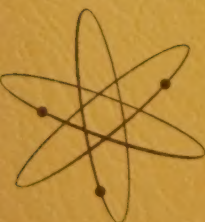
PRICE \$2.00

HEATHKIT[®] ASSEMBLY MANUAL

HEATHKIT[®] by DAYSTROM

**STEREO MONOPHONIC
RECORD CHANGER**

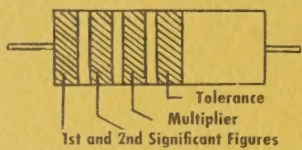
MODEL AD-60



STANDARD COLOR CODE — RESISTORS AND CAPACITORS

AXIAL LEAD RESISTOR

Brown — Insulated
Black — Non-insulated



Wire wound resistors have
1st digit band double width

INSULATED
UNINSULATED
Color

BLACK
BROWN
RED
ORANGE
YELLOW
GREEN
BLUE
VIOLET
GRAY
WHITE

FIRST RING
BODY COLOR
First Figure

0
1
2
3
4
5
6
7
8
9

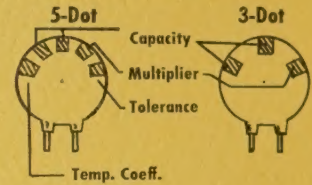
SECOND RING
END COLOR
Second Figure

0
1
2
3
4
5
6
7
8
9

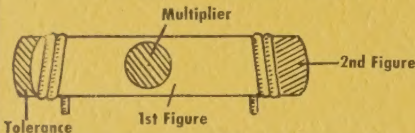
THIRD RING
DOT COLOR
Multiplier

None
0
00
,000
0,000
00,000
000,000
0,000,000
00,000,000
000,000,000

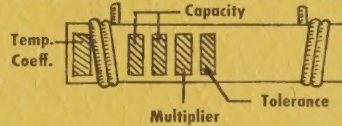
DISC CERAMIC RMA CODE



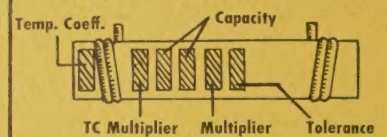
RADIAL LEAD DOT RESISTOR



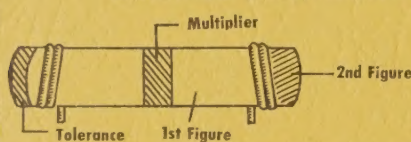
5-DOT RADIAL LEAD CERAMIC CAPACITOR



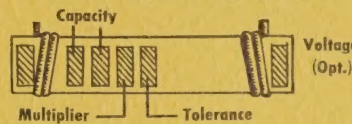
EXTENDED RANGE TC CERAMIC HICAP



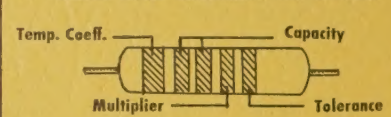
RADIAL LEAD (BAND) RESISTOR



BY-PASS COUPLING CERAMIC CAPACITOR



AXIAL LEAD CERAMIC CAPACITOR



The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heathkits are 1/2 watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors 1/2 watt, 1 or 2 watt may be color coded but the first band will be double width.

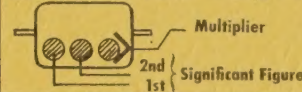
MOLDED MICA TYPE CAPACITORS

CURRENT STANDARD CODE

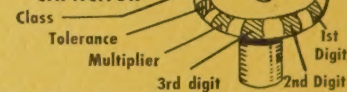


JAN &
1948
RMA
CODE

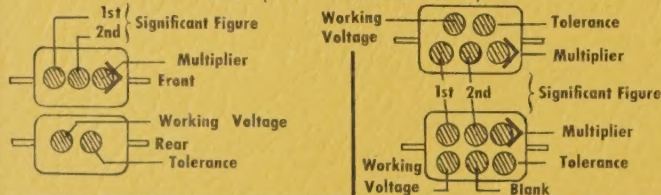
RMA 3-DOT (OBSOLETE) RATED 500 W.V.D.C. ± 20% TOL.



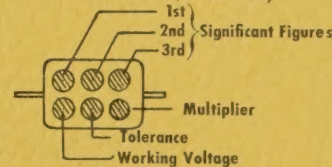
BUTTON SILVER MICA CAPACITOR



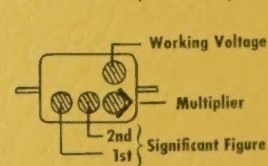
RMA (5-DOT OBSOLETE CODE)



RMA 6-DOT (OBSOLETE)

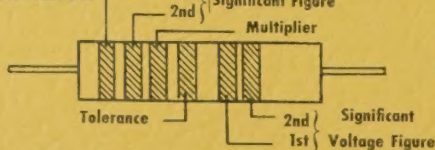


RMA 4-DOT (OBSOLETE)



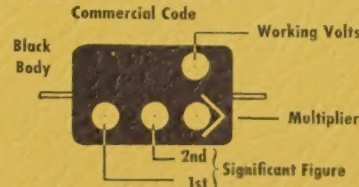
MOLDED PAPER TYPE CAPACITORS

TUBULAR CAPACITOR

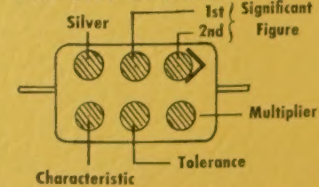


A 2 digit voltage rating indicates more than 900 V.
Add 2 zeros to end of 2 digit number.

MOLDED FLAT CAPACITOR



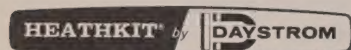
JAN. CODE CAPACITOR



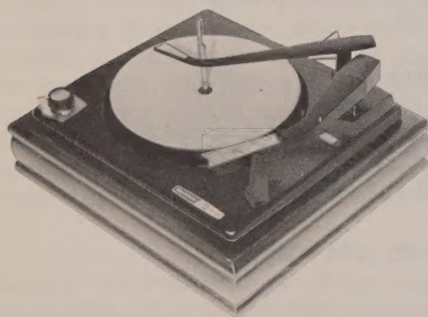
The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

Assembly and Operation of the



STEREO MONOPHONIC RECORD CHANGER MODEL AD-60



HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

 a subsidiary of
DAYSTROM, INCORPORATED

TABLE OF CONTENTS

PAGE

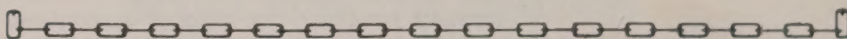
Specifications..	2
Introduction..	3
Preliminary Notes and Instructions.. . . .	3
Parts List..	4
Proper Soldering Techniques..	5
Step-By-Step Procedure..	7
Step-By-Step Assembly..	7
Initial Mechanical Check Out..	20
How To Operate..	22
Notes On Operation..	23
Mechanical Maintenance..	24
Service Notes..	26
Service Information..	32
Service..	32
Replacements..	33
Shipping Instructions..	33
Warranty..	34

SPECIFICATION CHANGES

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

SPECIFICATIONS

Operates From:	105-130 volts 60 cycles.
Wow And Flutter:	Less than 0.18% rms at 33-1/3 rpm.
Turntable Speed:	Accurate within $\pm 2\%$.
Change Cycle:	Completed in 9 seconds.
Dimensions:	13-1/2" wide x 12" deep. 5" above and 3" below mounting board.
Motor Type:	4-pole hum shielded.
Type Of Drive:	Friction.
Record Capacity:	10.
Record Speeds:	4 speeds Automatic and Manual speed selection - 33-1/3, 45, 78 rpm. Manual speed selection only - 16 rpm.
Variation In Tracking Force:	Less than 0.9 gram from first record to tenth record.
Controls:	ON-OFF switch. STEREO-MONO switch. SPEEDMINDER (Automatic speed selection and indexing). Manual Speed Selector (4 Speeds).
Finish:	Satin black with gold trim.
Net Weight:	10 lbs.
Shipping Weight:	13 lbs.



INTRODUCTION

The HEATHKIT High Fidelity Record Changer Model AD-60 incorporates the most advanced developments in record changer design. Heretofore there has been considerable discussion as to the adaptability of record changers to high fidelity systems, the popular opinion being that the inherently complex mechanical function of these instruments subjects them to excessive rumble, wow and flutter. One of the most undesirable features of conventional record changers is the unnecessary record wear which occurs when a record is dropped onto a moving turntable. The HEATHKIT AD-60 has been designed to exactly reproduce the recording without introducing excessive external interference and to keep record wear to a minimum.

Besides being attractively styled, the AD-60 has several unusual operating features. The most noticeable of these is that the turntable comes to a complete stop during the change cycle and does not resume until the tone arm is in position for the next record. This eliminates excessive record wear. When the cycle is completed, the turntable is set in motion rapidly but smoothly. The smooth start is accomplished by a friction clutch on the idler which engages the turntable; this eliminates the "jerk" when setting the turntable in motion, and yet allows the proper speed to be reached in about $1/5$ of a turn.

Another unusual feature of this changer is that the change cycle is constant regardless of which speed has been selected. This is accomplished by isolating the record change mechanism from the turntable drive. While the record is playing, drag is reduced by disengagement of the change mechanism from the turntable. The change cycle is completed in 9 seconds. The tone arm may be stopped at any point during the change cycle, or during record play, without causing damage to the associated mechanism. The tone arm

may also be relocated during automatic play without tripping the change mechanism.

The HEATHKIT Model AD-60 features automatic and manual operation at 33, 45, and 78 rpm speeds. For playing 16 rpm records the speed selector knob must be manually set to the "16" position. By leaving the speed selector knob in the SPEEDMINDER position, you may play automatically 33- $1/3$, 45, or 78 rpm records without resetting the speed selector; you need only to select the proper stylus. Both 33- $1/3$ and 45 rpm (7, 10 and 12 inch) records may be intermixed in any order and they will play at proper speeds.

The tracking force varies only 0.9 gram from the first record to the tenth record. This is accomplished by horizontal mounting of the tension spring, thus keeping the spring length very nearly constant as the tone arm moves vertically.

Tone arm resonance is kept below 20 cycles by constructing the tone arm of an aluminum casting with reinforcing ribs and having no parallel sides.

Other features of this record changer include sound output muting during the change cycle, and a capacitor-resistor filter across the motor switch contacts to eliminate annoying noise in the speaker system when the changer shuts off. An "anti-skate" device prevents the tone arm from skating through record "lead-in" grooves. A "stereo-mono" switch instantly converts the stereo cartridge for playing monophonic records.

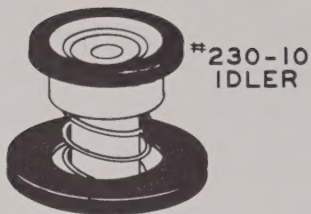
The HEATHKIT record changer is virtually foolproof. Under normal operation, the instrument does its own thinking in selecting the proper speeds and tone arm positioning.

PRELIMINARY NOTES AND INSTRUCTIONS

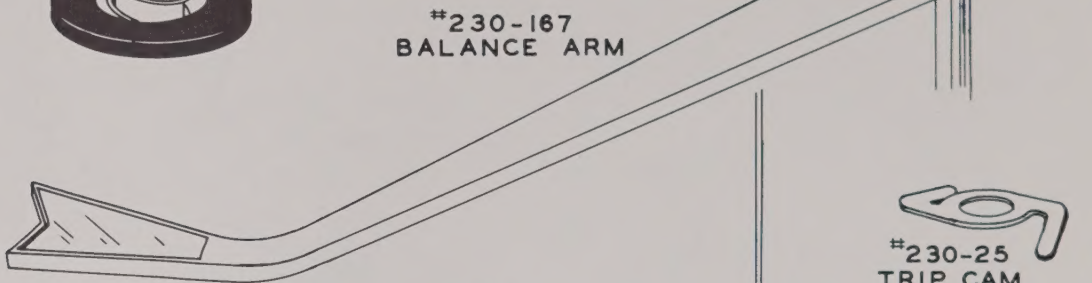
The HEATHKIT high fidelity record changer is a high quality instrument and care used during its construction will be rewarded by trouble-free operation.

This manual is supplied to assist you in every way to complete the instrument with the least possible chance for error. We suggest that you

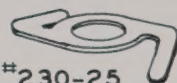
take a few minutes now and read the entire manual through before any work is started. This will enable you to proceed with the work much faster when construction is started. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.



#230-10
IDLER

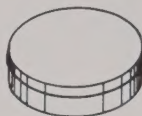


#230-167
BALANCE ARM



#230-25
TRIP CAM

#230-46
LUBRICANT TIN



#230-38
FIBER WASHER



#2
MOTO
GR

#230-18
KNOB



#230-42
RETAINING RING

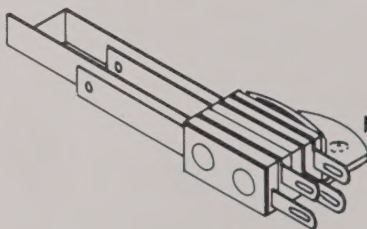


#2
RETAI

#230-140
PINION-DRIVER



#230-17
SPINDLE



#230-164
MUTING SWITCH

#230-91
HEXHEAD
SCREW



#23
F
W

#230-139
FIBER WASHER



#23
BALL



#230-172
CLEAR PLASTIC
SLEEVING



#230-28
CLEAR PLASTIC
SLEEVING



#230-22
SWITCH
SHIELD



#230-24
THRUST
WASHER



#230-28
ER ARM
PRESSION
RING



#230-40
MOUNTING
GROMMET



#230-259
RING RETAINING RING



#230-137
T
HER



#230-42
BEARING



#230-41
RETAINING
RING



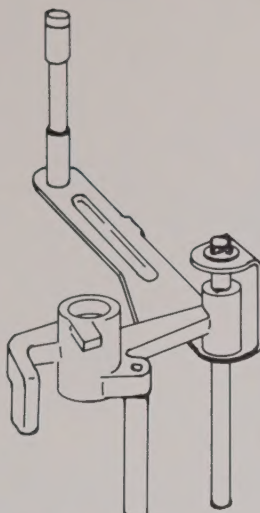
#230-267
RING RETAINING RING



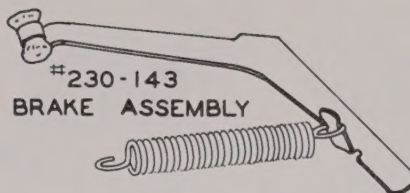
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RETAINING RING



#230-265
SPINDLE NUT



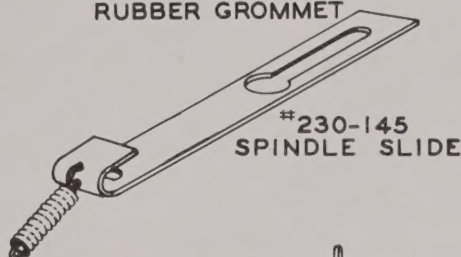
#230-2
IDLER ARM
ASSEMBLY



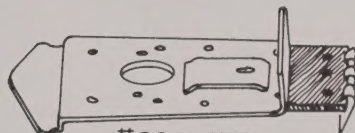
#230-143
BRAKE ASSEMBLY



#230-144
RUBBER GROMMET



#230-145
SPINDLE SLIDE



#230-177
CARTRIDGE MOUNTING
BRACKET



#230-179
SPACER



#230-180
SPACER



#230-181
3-48x9/16" SCREW



#230-182
3-48x 7/16" SCREW



#230-183
3-48x 1/4" SCREW



#230-184
78 RPM SHIFT
WAND

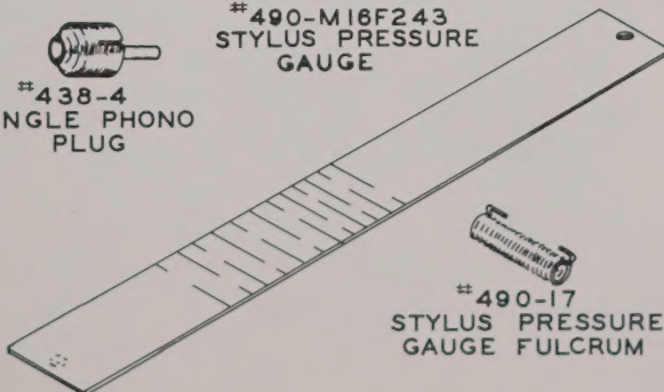


#438-4
SINGLE PHONO
PLUG

#490-M16F243
STYLUS PRESSURE
GAUGE



#490-17
STYLUS PRESSURE
GAUGE FULCRUM



UNPACKING INSTRUCTIONS

UNPACK THE KIT CAREFULLY, EXAMINE EACH PART CAREFULLY AND CHECK IT AGAINST THE PARTS LIST. Refer to the parts pictorial as an aid in identifying the parts. Lay out all parts so that they will be readily available when assembly is started. If a shortage is

found, attach the inspection slip to your claim and notify us promptly. Notice that the bags containing small parts are labeled D, EE, F, and #5714-506. DO NOT MIX THESE PARTS SINCE REFERENCE IS MADE IN THE MANUAL TO PARTS IN A SPECIFIC BAG.

PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
----------	---------------	-------------

Miscellaneous Parts

89-1	1	Power cord
343-3	1	Length shielded cable
344-1	1	Hookup wire
347-7	1	Length 4-conductor cable
391-11	1	Nampelate ✓
438-4	2	Single phono plug ✓
490-17	1	Stylus pressure gauge/fulcrum ✓
595-380	1	Manual ✓
490-M16F243	1	Stylus pressure gauge
	1	Cartridge with instruction sheet

Changer Package Assembly

The following parts are bulk packed.

230-10	1	Idler
230-17	1	Spindle
230-46	1	Lubricant tin ✓
230-141	1	Motor ✓
230-165	1	Changer sub-assembly ✓
230-167	1	Balance arm
230-168	1	Turntable assembly ✓
230-169	1	Turntable mat ✓

The following parts are packed in bag "D".

230-18	1	Knob ✓
230-140	1	Pinion-driver ✓
230-164	1	Muting switch ✓
230-172	1	Length clear plastic sleeving ✓

PART No.	PARTS Per Kit	DESCRIPTION
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The following parts are packed in bag "EE".

230-22	1	Switch shield ✓
230-24	2	Thrust washer ✓
230-25	1	Trip cam ✓
230-26	1	Length clear plastic sleeving ✓
230-28	1	Idler arm compression spring ✓
230-38	6	Fiber washer 5/16" OD x 3/16" ID (3 extra) ✓
230-40	3	Motor mounting grommet ✓
230-41	3	Retaining ring 21/64" OD, for idler (1 spare)
230-42	4	Retaining ring 3/8" OD, for motor (1 spare)
230-91	1	#6 x 3/16" hex head screw
230-137	3	#10 flat washer
230-138	1	Retaining ring 3/8" OD x 1/16" ID, for pinion driver
230-139	1	Fiber washer, 1/4" OD x 1/8" ID
230-142	1	Turntable ball bearing
230-259	1	Retaining ring 7/16" OD, for balance arm
230-265	1	Nut, spindle
230-267	1	Retaining ring, for spindle

PART No.	PARTS Per Kit	DESCRIPTION
-------------	------------------	-------------

The following parts are packed in bag "F".

230-2	1	Idler arm assembly
230-14	1	Brake assembly
230-144	1	Rubber bumper grommet
230-145	1	Spindle slide
230-175	1	Spindle slide spring

PART No.	PARTS Per Kit	DESCRIPTION
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The following parts are packed in bag #5714-506.

230-177	2	Cartridge mounting bracket
230-178	1	Instruction sheet
230-179	4	#3 x 7/32" spacer
230-180	4	#3 x 1/8" spacer
230-181	4	3-48 x 9/16" fillister head screw
230-182	4	3-48 x 7/16" pan head screw
230-183	4	3-48 x 1/4" pan head screw
230-184	1	78 rpm shift wand

PROPER SOLDERING TECHNIQUES

Only a small percentage of HEATHKIT equipment purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest portion malfunction due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 30 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

WIRING AND SOLDERING

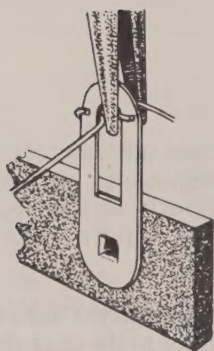
1. In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the construction step.
2. To avoid breaking internal connections when

stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.

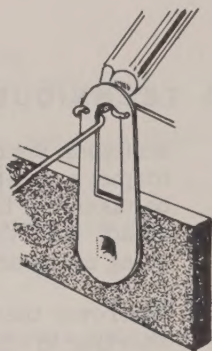
3. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated construction step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.
4. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending or if the step states that the wire is not to be crimped, position the wire so that a good solder connection can still be made.
5. Position the work, if possible, so that gravity will help to keep the solder where you want it.
6. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

7. Then place the solder against the heated terminal and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.
8. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.

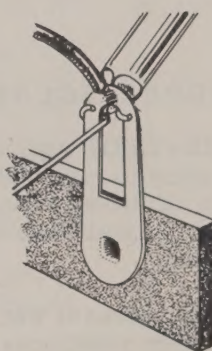
A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth bright appearance.



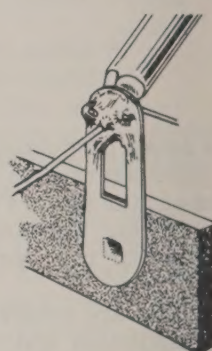
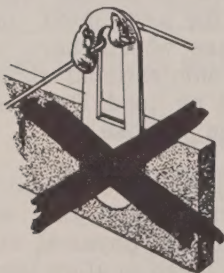
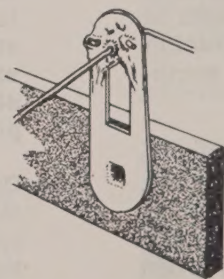
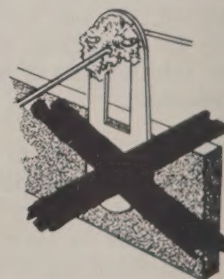
CRIMP WIRES



HEAT CONNECTION



APPLY SOLDER

ALLOW SOLDER
TO FLOWCOLD SOLDER JOINT
CONNECTION INSUFFICIENTLY
HEATEDPROPER SOLDER
CONNECTIONCOLD SOLDER JOINT
CONNECTION MOVED
WHILE COOLING

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but, because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. (In cases where a lead passes through a terminal or lug and then connects to another point, it will count as two leads, one entering and one leaving the terminal.)



STEP-BY-STEP ASSEMBLY

NOTE: The actual photographs on Pages 24 and 25 and the exploded view drawing will help visualization of the assembly and aid in parts identification.

() Arrange the necessary tools, hardware and parts so that you may reach them easily. You will need a small adjustable wrench, long-nose pliers, cutting pliers, solder,

small screwdriver, a soldering iron and some light weight lubricating oil.

() Locate the changer subassembly and check to see that the tone arm is secured to the rest post by the spring clasp. If it is not, secure the tone arm to the rest post by slipping the spring clasp over the arm. Leave the clasp in position during construction to prevent damage to the tone arm.

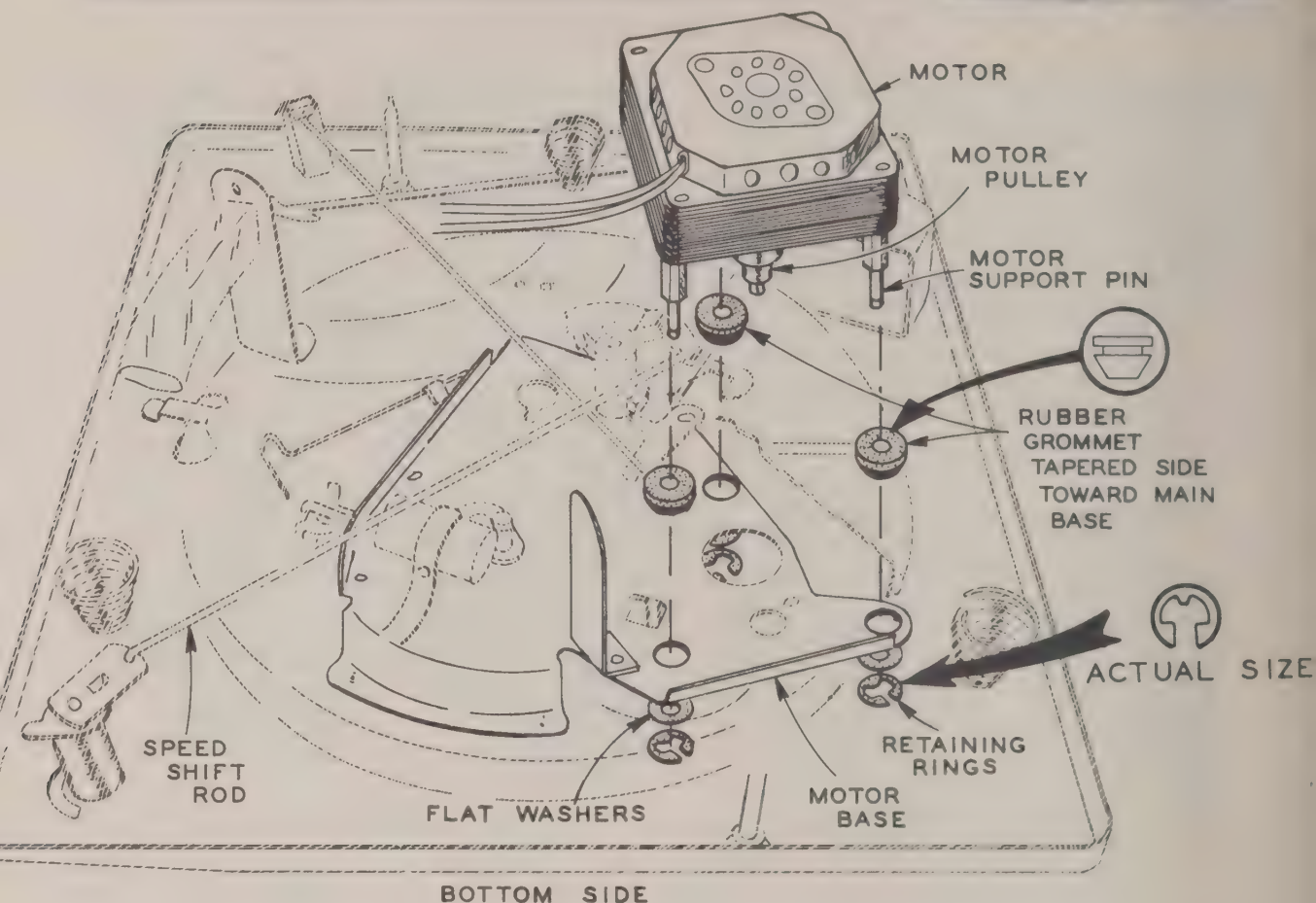


Figure 1

INSTALLING THE MOTOR

- () Place a soft cloth on the work surface to avoid scratching the finish of the changer.
- () With the changer subassembly positioned as shown in Figure 1, insert the three rubber grommets from bag "EE" in the motor support holes as indicated. Make sure the grommets are seated in their grooves with the tapered end between the changer base plate and the motor mounting plate.
- () Insert the motor support pins through the grommets. Refer to Figure 1.
- () Turn the assembly over and place one flat metal washer (bag "EE") on each motor support pin while holding the motor in place.
- () Secure the motor in position by snapping the three motor support retaining rings from bag "EE" into the grooves provided near the end of the support pins. Refer to Figure 1 and Detail 1A.

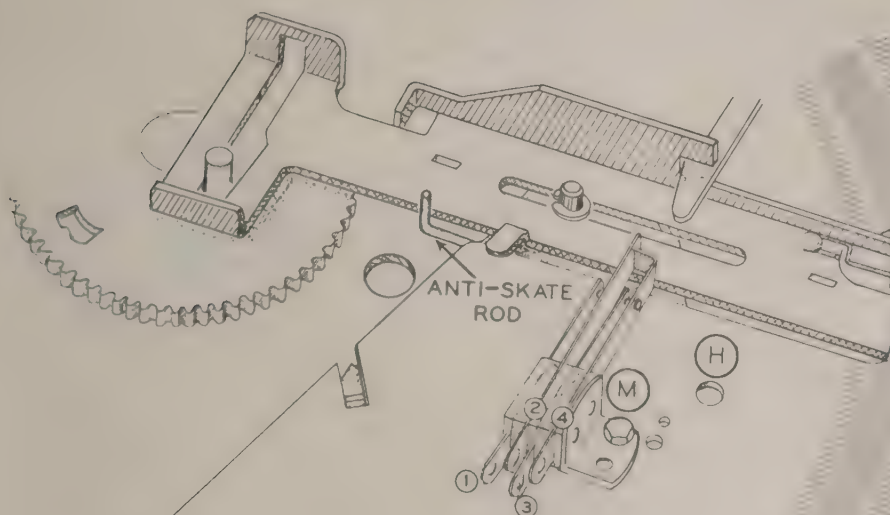


Figure 2

MUTING SWITCH INSTALLATION

Refer to Figure 2 for the following steps.

- () Manually rotate the main gear $1/2$ turn counterclockwise, then mount the muting switch (bag "D") at position M on top of the changer main base. Use one #6 x $3/16$ " hex head sheet metal screw (bag "EE"). This switch should be mounted so that its long leaf comes in contact with the rounded edge of the tab on the main slide when the main slide is in its rest position (main gear pin resting in notch along one side of slot in main slide). The muting switch contacts should be held open approximately $1/8$ " by the main slide tab. Counterclockwise ro-

tation of the main gear, and the associated travel of the main slide, will indicate whether or not the muting switch is properly mounted and adjusted.

NOTE: The anti-skate device prevents the tone arm from skating over the record lead-in grooves. This device is actuated during the change cycle by a slide rod which runs parallel to the main slide. One end of this slide rod is near the spindle (see Figure 2). This rod **MUST** slide freely. If necessary, bend the rod slightly, on the end next to the spindle, to obtain free movement. A light application of oil will also help to provide friction-free movement of the rod.

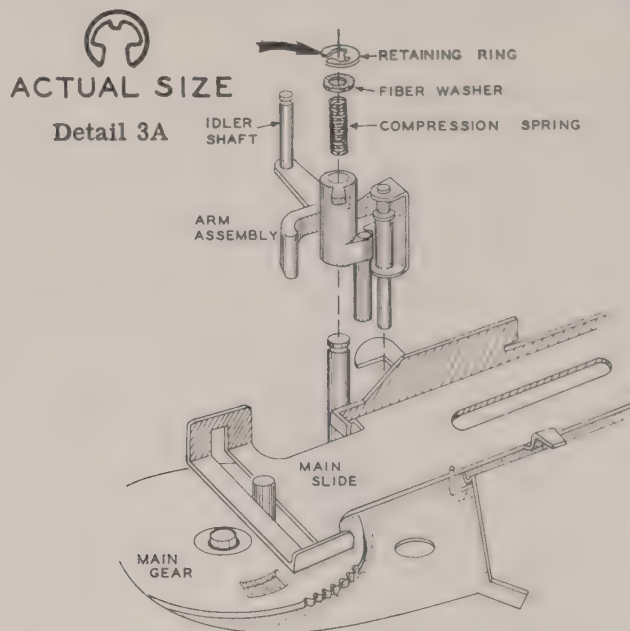


Figure 3

IDLER ARM INSTALLATION

- () With the changer assembly positioned as in Figure 3, slip the idler arm assembly (bag "F") over the pin next to the main slide. The counterbored side of the sleeve which slips over the pin should be upward.
- () Slip the large spring from bag "EE" over the pin until it is seated in the counter-sunk hole in the idler arm sleeve.
- () Compress this spring until a fiber washer and light retaining ring from bag "EE" can be placed in position. Snap the retaining ring into the groove in the top of the pin. See Figure 3 and Detail 3A.
- () Place two fiber washers from bag "EE" on the shaft on the outer end of the idler arm assembly. See Figure 4.
- () Lubricate the idler shaft by applying a thin coat of grease from the container supplied with the kit.
- () Place the idler on the idler shaft. (The wheel with the largest diameter sets next to the idler arm.)
- () Grease the surface of the top fiber washer that contacts the end of the idler bushing.
- () Secure the idler in place, using a fiber washer and retaining ring from bag "EE". See Figure 4 and Detail 4A.

IDLER INSTALLATION

CAUTION: Notice in the idler that there is a friction clutch which couples the turntable drive wheel to the motor drive wheel. The contact surfaces of this clutch must be kept completely free of grease and oil; otherwise excessive slippage would occur, thus causing improper rotation of the turntable.

NOTE: IDLER ALIGNMENT. After assembly of the record changer is completed, the idler may vibrate at certain speeds. If so, it is caused by misalignment of the idler and motor pulley. The condition can be corrected by placing additional fiber washers underneath the idler wheel. The idler should run approximately in the center of the motor pulley area for each of the four speeds.

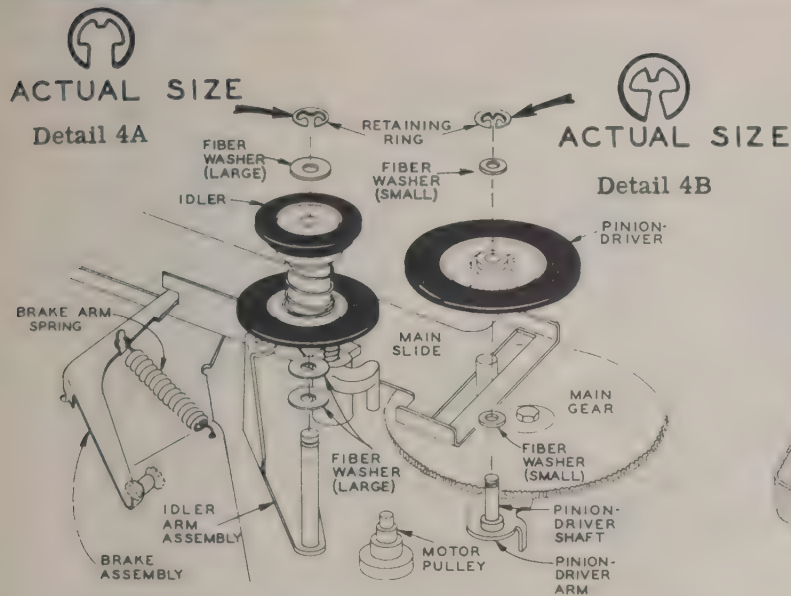


Figure 4

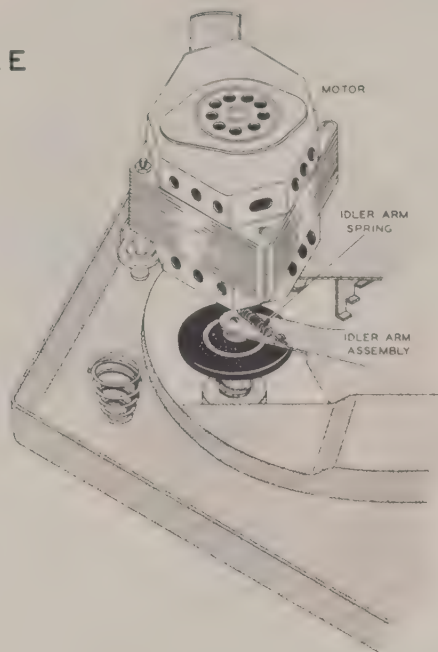


Figure 5

- () Turn the assembly over and connect the spring on the motor bracket to the hook provided on the lower side of the idler arm. See Figure 5.

BRAKE ARM INSTALLATION

- () With the changer positioned as shown in Figure 4, select the brake from bag "F" and install it as illustrated.
- () Hook the free end of the brake arm spring into the hole in the main base near the outer end of the brake arm.

PINION-DRIVER INSTALLATION

- () Place one of the smallest fiber washers (bag "EE") on the pinion-driver shaft located next to the large gear which drives the main slide. See Figure 4.
- () Lubricate the pinion-driver shaft with a thin coat of grease.
- () Install the pinion-driver (bag "D") on the shaft next to the main gear which drives the main slide. Place one small fiber washer on top of the pinion-driver. Refer to Figure 4.
- () Secure the pinion-driver using the retaining ring having the smallest inside diameter from bag "EE". See Detail 4B.

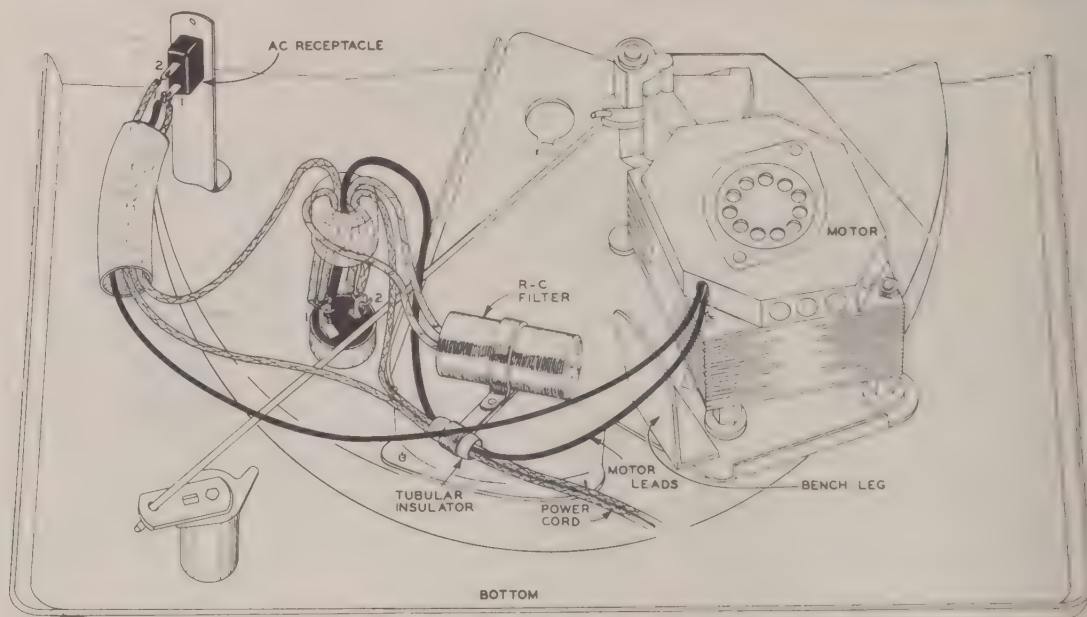
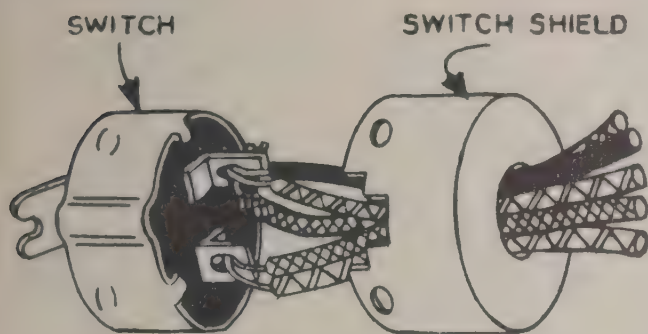


Figure 6

MOTOR, ON-OFF SWITCH, AND AC RECEPTACLE WIRING

Refer to Figure 6 for the following steps.

- () Position the changer as shown in Figure 6.
- () Select the large piece of clear plastic sleeving from bag "D". Insert one motor lead through this sleeving and connect the free end to lug 1 (NS) of the AC receptacle. Route the motor lead around the bench leg as shown.
- () Select the switch shield and small piece of clear plastic sleeving from bag "EE". Place the remaining motor lead through this clear plastic sleeving, then through the switch shield. Connect the end of this lead to lug 1 (NS) of the ON-OFF Switch.
- () Insert the two filter leads through the switch shield and connect one lead to lug 1 (NS) and one lead to lug 2 (NS) of the ON-OFF switch.
- () Select the power cord and separate the two leads for a length of 9" from the stripped ends. Cut 6" from one lead. Save this 6" piece as it will be used in the next step.
- () Strip 1/4" insulation from the ends of the 6" length of wire just clipped from the line cord. Tin (apply a small amount of solder) to the ends of this lead and connect one end to lug 2 (S-1) of the AC receptacle. Leave the other end free.
- () Strip and tin the end of the short lead of the power cord. Insert both leads of the power cord through the small plastic sleeving, then insert the short lead through the switch shield and connect it to lug 2 (S-2) of the ON-OFF switch.
- () Clip 3" from the long lead of the power cord. Strip and tin 1/4" of this lead. Insert the prepared end through the large plastic sleeving and connect to lug 1 (S-2) of the AC receptacle.
- () Insert the free end of the lead previously connected to lug 2 of the AC receptacle through the large plastic sleeving then through the switch shield and connect it to lug 1 of the ON-OFF switch (S-3).
- () Now push the large plastic sleeving snugly into place over the AC receptacle. This sleeving should entirely cover the portion of the AC receptacle protruding through the bench leg.



Detail 6A



Figure 7

- () Slip the switch shield down along the wires and snap it into place over the ON-OFF switch. See Detail 6A.
- () Place the small plastic sleeving (on power cord and one motor lead) in the cable clamp; squeeze the clamp together to hold the wires in place. Leave enough slack in the wires to insure that they will not interfere with movement of the speed shift rod.

This completes wiring of the motor, AC receptacle and ON-OFF switch.

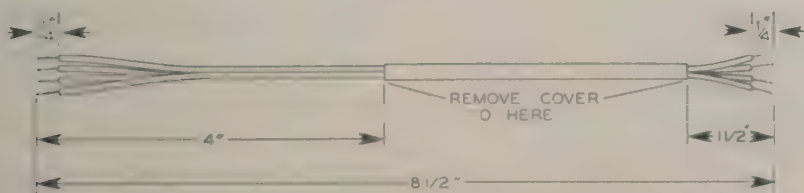
MUTING SWITCH WIRING

- () Identify the length of 4-conductor cable. Cut the cable to a length of 8-1/2" and prepare as shown in Detail 7A. Remove 4" of the outer cover at one end and 1-1/2" of the cover at the opposite end. Strip and tin 1/4" of the ends of each lead.

Refer to Figure 7 for the following steps.

- () Twist the 4" leads to form a twisted cable, then insert these leads through hole H in the changer main base. The leads are inserted from the bottom of the changer base.
- () Connect the GREEN lead to lug 3 (S-1) of muting switch M.
- () Connect the RED lead to lug 1 (S-1) of muting switch M.
- () Connect the BLACK lead to lug 4 (S-1) of muting switch M.
- () Connect the WHITE lead to lug 2 (S-1) of muting switch M.

Detail 7A



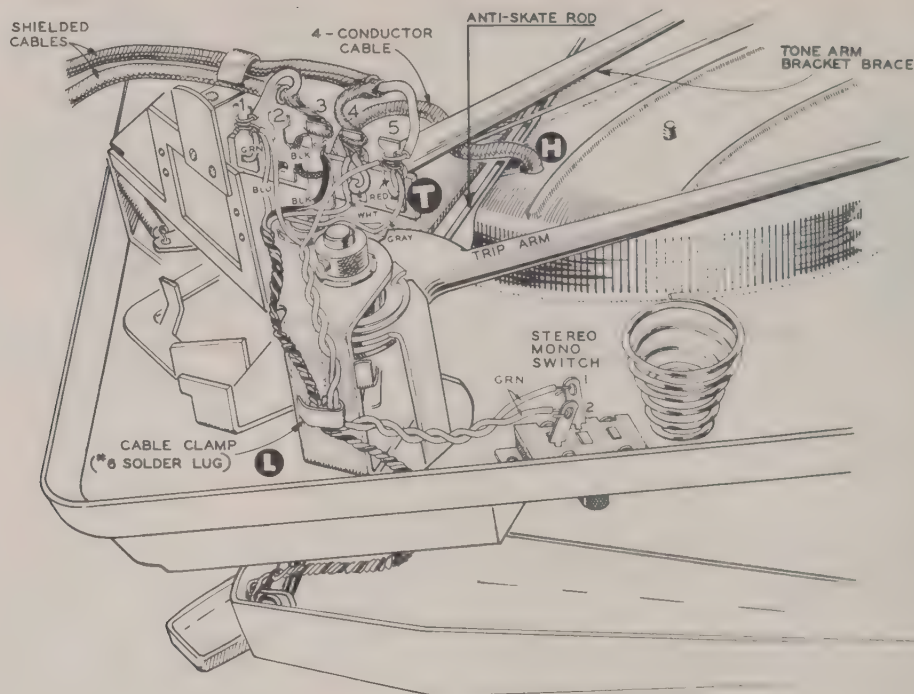


Figure 8

Refer to Figure 8 for the following steps.

() Route the opposite end of this 4-conductor cable between the changer main base and the tone arm bracket brace.

() Insert the four leads at this end of the cable through the lower holes in terminal strip T, as follows:

GREEN through lug 1
BLACK through lug 3
WHITE through lug 4
RED through lug 5

() Connect these leads as follows:

GREEN to lug 1 (NS)
BLACK to lug 3 (NS)
WHITE to lug 4 (NS)
RED to lug 5 (NS)

NOTE: The wires coming from the tone arm are precut to the correct length. Do not cut these wires.

() Identify the BLACK wire coming from the tone arm and connect this wire to lug 3 (NS) of terminal strip T.

() Identify the BLUE tone arm lead and connect it to lug 1 (NS) of terminal strip T.

() Identify the GRAY tone arm lead and connect it to lug 5 (NS) of terminal strip T.

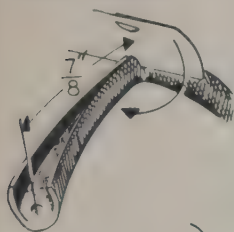
() Identify the WHITE tone arm lead and connect it to lug 4 (NS) of terminal strip T.

() Cut one 6" and one 7" piece of hookup wire and strip 1/4" insulation from each end of each wire. Place the wires together with two ends even then twist the wires to form a twisted pair.

() At the even ends of the twisted pair just prepared, connect one wire to lug 1 (S-1) and one wire to lug 2 (S-1) of the STEREO-MONO Switch. Leave the other ends free.

Taking care not to cut outer layer of very thin wires of (shield) remove outer insulation.

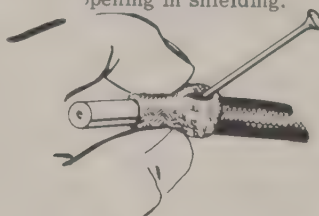
1. (shield) remove outer insulation.



2. Push back outer conductor (shield).

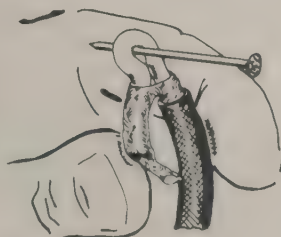


3. Push wire strands aside to make opening in shielding.



4.

Bend as shown



5.

and carefully pick out innerconductor and it's insulation.



6.

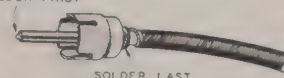
Cut and remove inner insulation.



7.

Remove fiber insulation

SOLDER FIRST



SOLDER LAST

Figure 9

- () At the free end of the twisted pair connect the short wire to lug 5 (NS) and the long wire to lug 1 (NS) of terminal strip T.
- () Bend the lug mounted at position L around the tone arm leads and STEREO-MONO Switch leads. This solder lug serves as a cable clamp to hold the leads in place.

Refer to Figure 9 for the following steps.

- () Locate the shielded cable and cut it in half.
- () Cut away 7/8" of outer insulation on each end of one length of shielded cable. At each end, push the braid back until a bulge develops near the ends of the outside insulation. Bend the wire over double at the bulge point, separate the braid strands, and pull the inner conductor through the hole. Pull lightly on the separate braid ends to tighten them into leads. Strip 5/8" of insulation from the center conductor on one end and 1/4" from the other end.

CAUTION: Avoid overheating the shielded cable leads. Excess heat will melt the inner insulation, resulting in a short circuit between the shield and inner conductor.

- () Install a phone plug on the 5/8" stripped end of the audio cord (shielded cable), as shown.
- () Prepare another audio cable as before and install the phono plug on one end.
- () Connect the inner conductor of the cable just prepared to lug 1 (S-4) of terminal strip T, as shown in Figure 8.
- () Connect the stranded shield of this audio cable to lug 3 (S-3) of terminal strip T. NOTE: This is the "Channel A" or left channel lead. It will prove helpful later on to identify this lead by marking it with a piece of masking tape near the phono plug end.
- () Select the other prepared audio cable. Connect the inner conductor of this cable to lug 5 (S-4) of terminal strip T.
- () Connect the stranded shield of this audio cable to lug 4 (S-3) of terminal strip T.
- () Place both audio cables in the support clamp and secure both by squeezing the clamp with a pair of pliers. See Figure 8.
- () Check the tone arm and muting switch wiring to insure that it does not restrict any mechanical movements of changer parts.

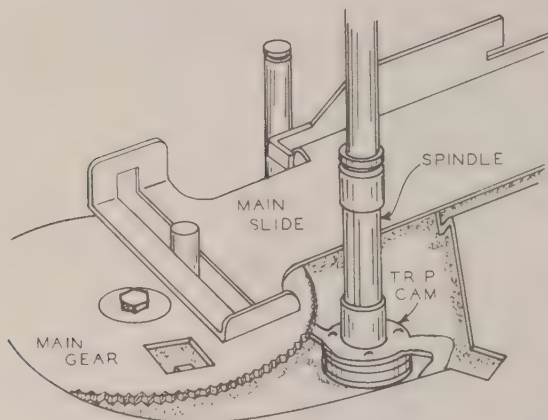
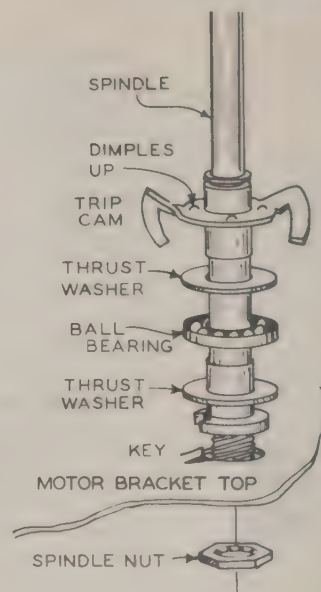


Figure 10



Detail 10A

SPINDLE ASSEMBLY

- () Unwrap the spindle and place it through the hole in the motor bracket as shown in Figure 10 and Detail 10A. Do not secure in position as yet.
- () Take the ball bearing, two thrust washers and trip cam from bag E. Place these four parts on the spindle as shown in Detail 10A. Lubricate with light oil.
- () Secure the spindle in place, using the large spindle nut from bag "EE". Tighten the spindle nut firmly in place after making certain the slot in the spindle is aligned with the key on the motor bracket.
- () With the changer positioned as shown in Figure 11, install the spindle slide on the main gear crank pin. The crank pin should slip into the slot in the spindle slide. Pull the spindle slide toward the spindle until the spindle levers can be inserted into the hole at the end of the spindle slide.
- () Hook the free end of the spindle slide spring through the hole in the "V" shaped cam near the lower end of the spindle. See Figure 11. The 78 rpm shift lever must be between the spindle slide spring and the motor base plate.

SPINDLE SLIDE INSTALLATION

- () Place the small rubber bumper grommet (bag "F") in the hole in the motor base plate as shown in Figure 11. Install this bumper grommet so that the ear of the "V" shaped cam will rest on the flat side of the grommet.
- () Locate the spindle slide with spring attached (bag "F") and apply a thin film of grease (from grease cup) along the slot in the slide.

BALANCE ARM INSTALLATION

- () Give the balance arm pivot rod a light application of oil. Insert the balance arm pivot rod through the hole in the balance arm post. Rotate the end of the arm inward toward the spindle until the pin in the pivot rod is lined up with the slot in the post. The pivot rod will drop through the post to the bracket below the main base. When inserting the pivot rod through this bracket, the

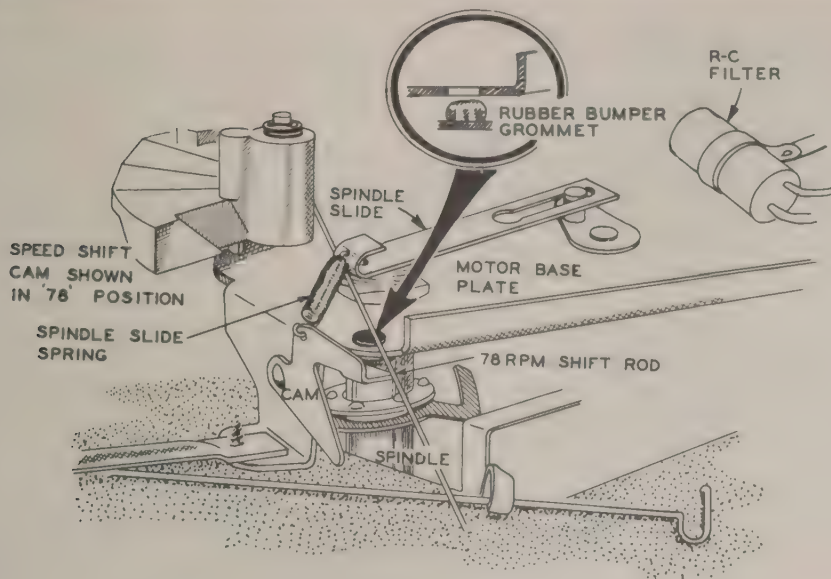


Figure 11

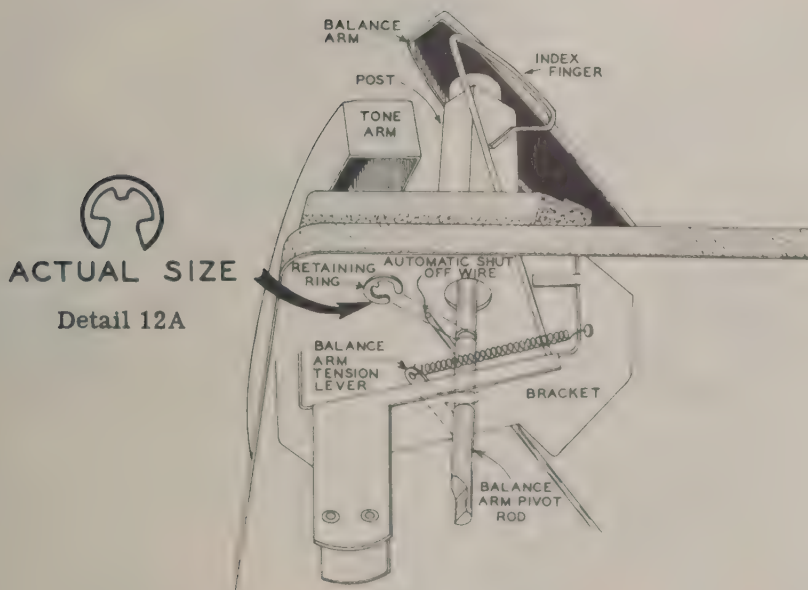


Figure 12

end will strike a small lever with a spring attached. This lever will cover the hole in the bracket through which the pivot rod goes. Move the lever aside so it will bear against the flat on the end of the pivot rod. The balance arm will now drop into position. See Figure 12.

- () Install the balance arm retaining ring (medium size ring in bag "EE") in the slot located about 2-1/2" from the lower end of the pivot rod. See Detail 12A.

NOTE: The balance arm retaining ring must be above the end of the automatic shut off wire.

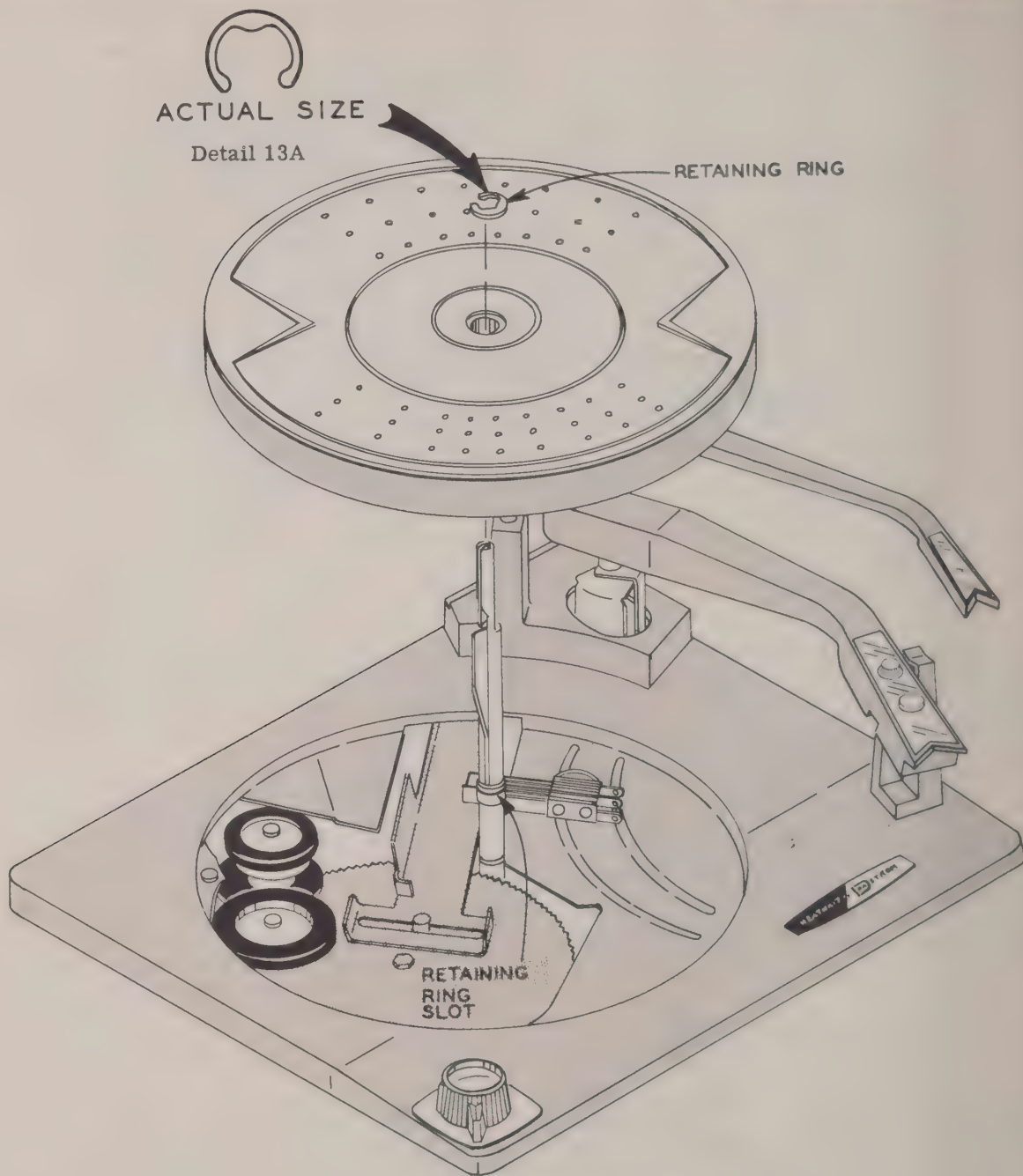


Figure 13

TURNTABLE INSTALLATION

- () Lightly grease the outside of the spindle stud and/or inside of turntable bushing. Be careful to keep grease off the portion of the spindle which contacts records.
- () Place the turntable on the spindle and secure it in position with the large retaining ring from bag "EE". See Figure 13 and Detail 13A.
- () Push the speed selector knob (bag "D") onto the selector switch shaft.
- () Install the nameplate as follows:
 - A. The surface to which the nameplate is to be applied should be clean and dry.
 - B. Remove the paper backing from the nameplate. A pin or pointed knife blade can be used to start removal of the paper backing and to remove any paper that might remain in the back of the nameplate. Do not touch the adhesive back with your fingers.
 - C. Apply the nameplate with even finger pressure; even pressure is the key to good adherence.

This completes assembly of the record changer. Instructions for mounting the cartridge are contained in the CARTRIDGE MOUNTING INSTRUCTION sheet located in bag #5714-506. This bag also contains two cartridge brackets and universal mounting hardware to accommodate most of the currently popular phonograph cartridges. The brackets are a "quick-change" type which may be installed and removed from the tone arm without disconnecting any wires.

NOTE: Disregard the instructions for a monophonic cartridge in the first paragraph under the illustration on the cartridge bracket mounting sheet. These instructions should read:

"For a monophonic cartridge, only the BLUE and BLACK leads are used. The remaining two leads may be coiled and tucked away under the other wiring for possible future use with a stereo cartridge. See Figures 1, 2, and 3."

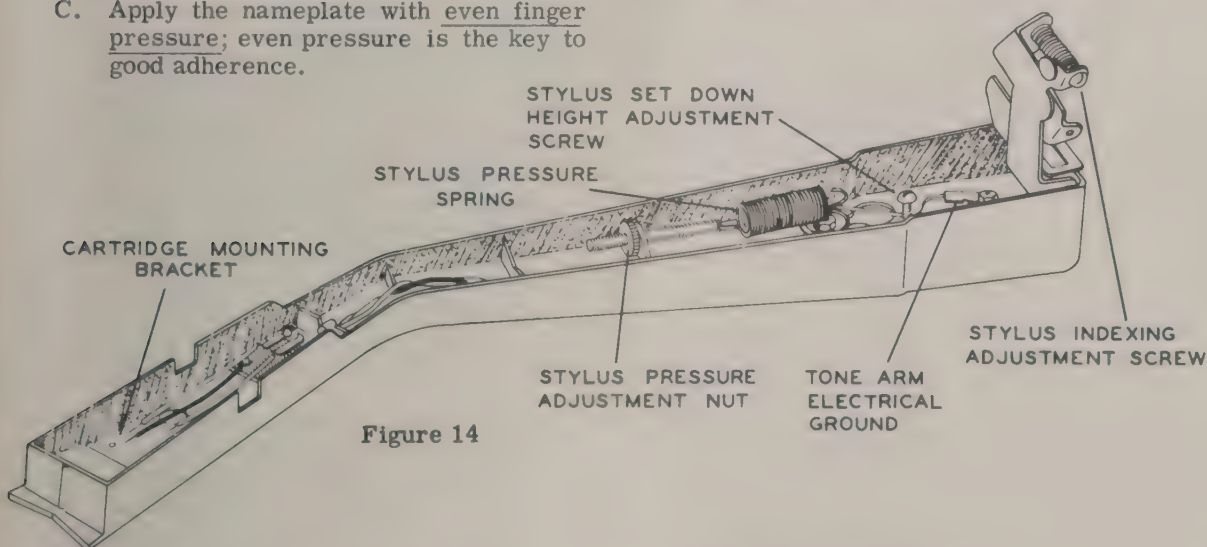


Figure 14

TONE ARM AND STYLUS ADJUSTMENT

These adjustments should be made only if checks reveal that it is necessary to do so.

A. Tone Arm Height Adjustment:

By pivoting the tone arm to an almost vertical position, the height adjustment screw is visible. See Figure 14. Adjust height of tone arm so that it will clear a record on the spindle shelf and the stylus clears a full stack of ten records on the turntable.

B. Stylus Pressure Adjustment:

The knurled nut for adjusting stylus pressure is located slightly to the rear of the tone arm center. See Figure 14. With tone arm in a horizontal position, turn the adjusting nut from right to left to reduce pressure. Adjust to the pressure recommended for your cartridge. A stylus pressure gauge is furnished with your changer. The use of this instrument enables you to adjust the stylus pressure to any specified value. Once you have properly adjusted the stylus pressure, it will remain so for many months of service.

- () Assemble the stylus pressure gauge as shown in Figure 15.
- () Place the stylus pressure gauge on a smooth surface such as a record on the turntable. The surface of the mat is unsatisfactory since it is not smooth.
- () Set the sliding balance point of the gauge to the weight as specified for the cartridge being used. See Figure 15.
- () Place the stylus in the dimple near the end of the gauge. See Figure 15.
- () Adjust the stylus pressure adjustment nut under the tone arm until the gauge is balanced in the horizontal position. See Figure 15. The correct pressure will now be applied to the stylus during record play.

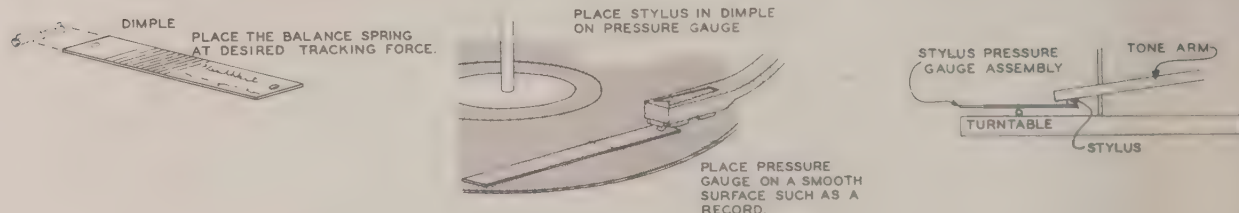


Figure 15

INITIAL MECHANICAL CHECK OUT

Before mounting the changer in a base or cabinet, a mechanical function test should be performed. The changer will sit on the three metal legs and may be operated in this position.

1. Plug the power cord into any conventional 117 volt 60 cycle power outlet.
2. Place a record (any standard size) on the spindle. Swing the balance arm over the record and allow it to drop into place. Remove the spring clip from the tone arm and swing it out of sight behind the tone arm rest post.
3. With the changer out of cycle, swing the tone arm slightly inward from the rest post and let it hang freely. It should rest 1/4" to 1/2" above the main base. This height can be adjusted as indicated in part A of TONE ARM AND STYLUS ADJUSTMENT section.
4. Push the ON-OFF lever to ON. The record should drop onto the turntable; the tone arm should swing over and sit down in the lead-in groove of the record. If the arm does not sit down in the lead-in groove, adjust the tone arm index screw. By lifting the tone arm about 1" from the

rest post, the index adjusting screw becomes accessible under the rear of the tone arm. See Figure 14. Using any size record, adjust so that the stylus comes to rest in the lead-in groove of the record. Turning the screw clockwise moves the stylus away from the record center. You need only to make this adjustment for one size record. Once the tone arm is properly indexed for one size record, it is also indexed for other sizes.

If the changer continues to repeat the change cycle without completing the play cycle, remove the turntable and check to see that the pinion-driver is operating freely. If the pinion-driver is not free, it may help to remove the fiber washer underneath the retaining ring.

Check to see that the pinion-driver bracket is not dragging on the motor case.

5. After the tone arm sets down in the record lead-in groove, the idler wheel will swing into position, engaging the motor pulley and turntable. The pinion-driver should fully disengage the motor pulley. If the turntable fails to commence rotation, check to see that the idler arm spring is in position. If the turntable rotates at an improper speed,

check to see that the idler wheel is engaging the proper motor pulley. (The smallest motor pulley is the 16 rpm position. Increasing sizes give faster turntable speeds.)

6. With the balance arm over the spindle, the changer, upon completion of record play, will cycle automatically. If the last record has dropped onto the turntable, the changer will shut off after completion of the last record.

If the changer does not cycle at the end of a record, check to see that the trip cam on the spindle is engaging the velocity trip arm which follows the tone arm underneath the main base. Movement of the trip arm must not be restricted by the wiring.

7. The turntable should come to a complete stop during the change cycle. If it fails to do so, inspect the brake arm to insure that the felt pad presses against the turntable rim during the change cycle. Also inspect the latch on the control slide to see that it engages the idler arm pin.

8. If the turntable vibrates excessively, it may be caused by improper alignment of the idler wheel with the motor pulley. This can be remedied by placing additional fiber washers underneath the idler wheel. The idler should run approximately in the center of the motor pulley for each of the four speeds.

9. If the balance arm cannot be lifted from its position next to the spindle, check to see that the end of the rod which goes to the power switch lever assembly is positioned properly in relation to the balance arm retaining ring. This rod should be below the retaining ring.

10. After manually shifting the changer through the four speeds and then returning to SPEEDMINDER position, the turntable will continue to rotate at 78 rpm. This is a normal function. To revert to automatic speed selection, push the ON-OFF lever to ON-REJ position and allow the changer to cycle automatically.

11. The manual speed selector knob may not turn smoothly at first. This stiff action is

due to minute imperfections in the sliding contact surfaces of the associated parts. After running through the manual speed ranges a few times, the sliding surfaces will become polished and the knob will turn smoothly. Greasing the top surface of the speed shift cam may eliminate stiff action.

12. Automatic selection of the 78 rpm speed is accomplished as follows: The 78 rpm wand protruding from the side of the cartridge bracket trips a pivoted arm in the rest post. The arm in turn trips the idler assembly by means of a thin rod, thus allowing the idler wheel to drop down and engage the 78 rpm motor pulley. If the rod should become bent, it may prevent automatic 78 rpm shift. Automatic 78 rpm selection could also be prevented if the 78 rpm wand is bent or misaligned.

13. If the turntable vibrates or wobbles, the trip cam can be improperly seated. The turntable hub has three slots in its lower end. The slots should be positioned over the three dimples in the trip cam. Hold the trip cam and rotate the turntable until you feel the table drop into position.

14. After completion of the kit, connect the changer to your amplifier-speaker system. If no signal is obtained, recheck the muting switch and audio cord wiring. If the tone arm leads are reversed on the terminals during wiring, the signal will be grounded at the changer assembly. If the audio cord leads are reversed, there will be excessive hum in the system. As a check to determine whether trouble is in the wiring, remove the connections to the cartridge and run two thin wires from the cartridge terminals (DO NOT SOLDER TO CARTRIDGE) to the amplifier inputs. If a signal is obtained in this fashion, the trouble is in the changer wiring. If still no signal is obtained, the trouble may be in the amplifier system or possibly in the cartridge.

15. If the changer shuts off before the last record drops, investigate the mechanism associated with the shut-off wire and balance arm retaining ring. Premature shut-off can be remedied by bending the outer end of the shut-off wire slightly downward.

HOW TO OPERATE

A SPEEDMINDER position is provided for the speed selector knob. The knob may be left in this position for automatically playing all 33-1/3 and 45 rpm records. Records (7, 10 and 12 inch) of both 33-1/3 and 45 rpm speeds may be intermixed in any order and they will play at the proper speed. The changer will not operate automatically at 78 rpm unless the 78 rpm shift wand is in place on the cartridge bracket. The changer will play 16 rpm records automatically by setting the selector knob to the "16" position.

A. SPEEDMINDER Operation

(Automatic and Intermix - 33-1/3 and 45 rpm. 78 rpm - automatic only.)

1. Set speed selector knob to SPEEDMINDER.
2. Move balance arm over tone arm rest post.
3. Load records on spindle.
4. Place balance arm on top of last record.
5. Push operating lever to ON to start.
6. Push operating lever to ON-REJ to reject a record.
7. Push operating lever to OFF if you wish to discontinue play. Changer will shut off automatically after last record has played.

B. MANUAL Operation

1. Set the speed selector knob to record speed desired.
2. Lift and move balance arm to a position over tone arm rest post.
3. Place record over spindle and on turntable. Be sure balance arm remains over tone arm rest post at all times during manual play. If balance arm is placed over spindle, the changer will resume automatic play.
4. Push operating lever to ON-REJ. The machine will cycle and set the tone arm down at the 7-inch record position. If you wish, you may stop the arm before it comes to rest on the record. Now, move the tone arm to the proper starting position back at the rest post and leave it there. Check to insure that the proper speed and correct stylus has been selected. If so, set the tone arm to the desired point on the record and the record will play.
5. At completion of the record, lift the tone arm and set it on the rest post. For successive records allow turntable to continue rotating and simply select the desired speed and stylus as required. You may set the tone arm to any position on the record. The machine will not trip while the balance arm is over the tone arm rest post.
6. Push lever to OFF position to discontinue play. If you wish to make the changer resume automatic operation, simply move the balance arm to position over the spindle while the record is in play.

NOTE: YOU CANNOT DAMAGE THE MECHANISM BY HOLDING OR MOVING THE TONE ARM DURING THE PLAY OR CHANGE CYCLE.

7. A special spindle is available so that you may adapt your changer for the use of 45 rpm records. This adapter spindle is designed to slip over the conventional spindle supplied. The 45 rpm adapter spindle may be ordered under part #230-171.

NOTES ON OPERATION

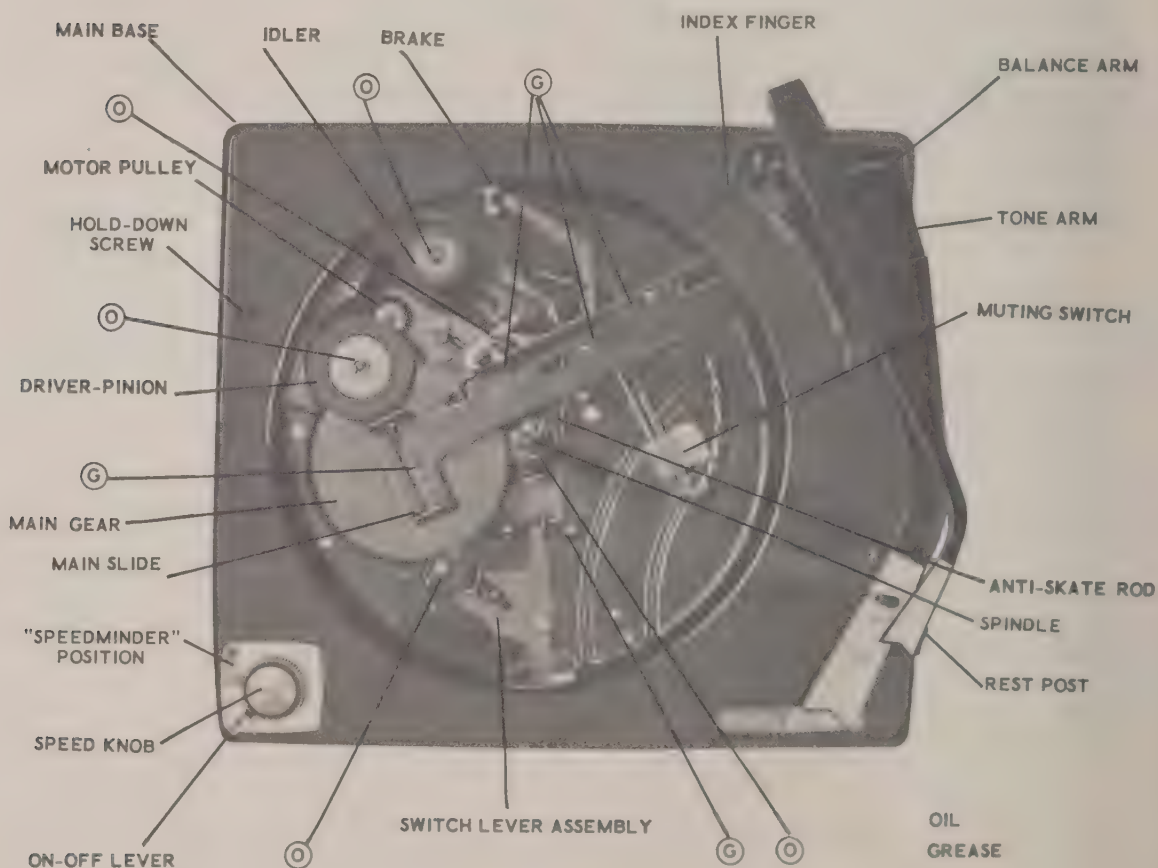
The following suggestions are included for your convenience:

1. If the record changer is to be moved, secure the tone arm to the rest post by slipping the spring clip into position, and back out the hold-down screws in the main base, thus compressing the springs against the mounting board. When mounting the changer in its cutout, be sure to flip the toggles on the hold-down screws.
2. Connect the record player only to a standard 60 cycle 117 volt outlet.
3. It is essential for minimum record wear and maximum performance that the record player be absolutely level. Let the tone arm hang freely between the rest post and turntable. Level the changer until the tone arm will not swing in either direction when the changer base is tapped lightly. Use adequate shims under the mounting board to achieve perfect level.
4. For best reproduction, keep the records and stylus clean.
5. Store records vertically, in folders or albums. Do not store records in direct contact with each other.
6. Records should not be left on the spindle except during operation since this encourages warping of the records.
7. When the changer is not in use, it is suggested that the speed selector knob be left in the SPEEDMINDER position.
8. During operation, the changer should float freely on the three springs.
9. Audio Connection: The shielded phono plug may be inserted in the phono jack provided on your amplifier or preamplifier. Some radios and television sets are also equipped with a phono jack for this purpose. If this changer is used in a monophonic system it may be necessary to connect a jumper wire between lugs 3 and 4 of terminal strip T in order to reduce hum.
10. With no cartridge in the tone arm, it will not set down on the turntable. This is no indication that the stylus pressure spring is improperly adjusted.
11. The turntable of your HEATHKIT record changer should come to a complete stop during the change cycle and remain at rest until the tone arm has come to position for the next play. If the turntable does not stop during the change cycle, check to see that the brake arm spring is in position and that the felt brake pad is making contact with the turntable rim. Also check to see that the latch on the control slide engages the idler arm.
12. The AC receptacle is wired so that an amplifier may be plugged into it and switched on or off by the on-off switch on the changer. Thus the amplifier will be automatically shut off when the changer shuts off at the end of record play.

MECHANICAL MAINTENANCE

Your HEATHKIT high fidelity record changer will require very little maintenance. Some lubrication may be required after an extended period of usage. Use a good quality lubricant such as No. 20 motor oil. Apply sparingly to points indicated on the accompanying photographs. Use the grease supplied with the kit on parts indicated.

CAUTION: DO NOT ALLOW GREASE OR OIL ON INSIDE OF TURNTABLE, ON RUBBER IDLER WHEEL, OR MOTOR PULLEY. SLIP- PAGE MAY RESULT. CLEAN THESE SURFACES OCCASIONALLY WITH WARM WATER AND SOAP. (DO NOT USE PETROLEUM SOLVENT.)



NOTE:

MAIN GEAR SHOWN ROTATED 90 DEGREES COUNTERCLOCKWISE FROM REST POSITION.

Figure 16

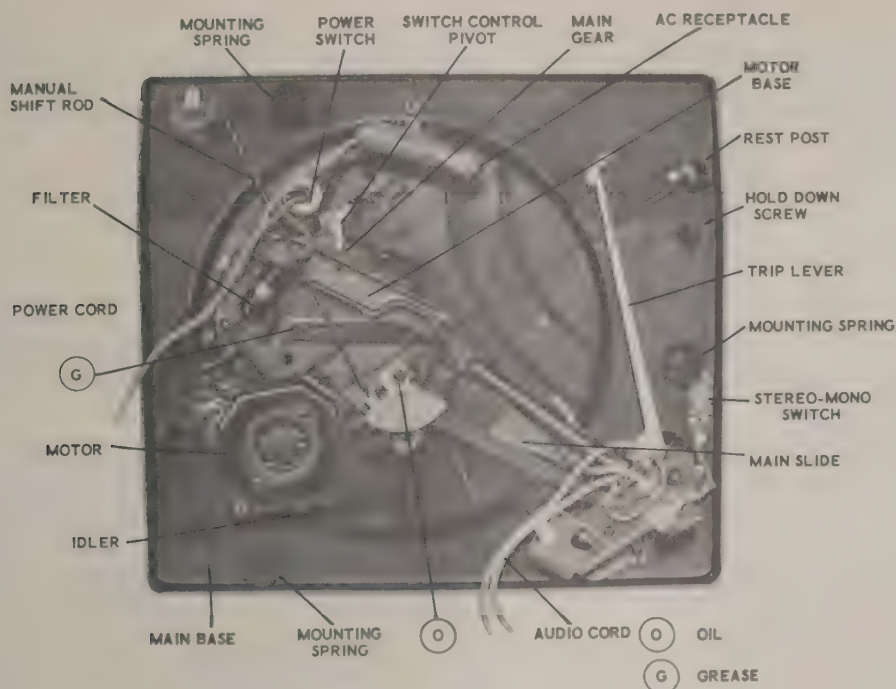


Figure 17

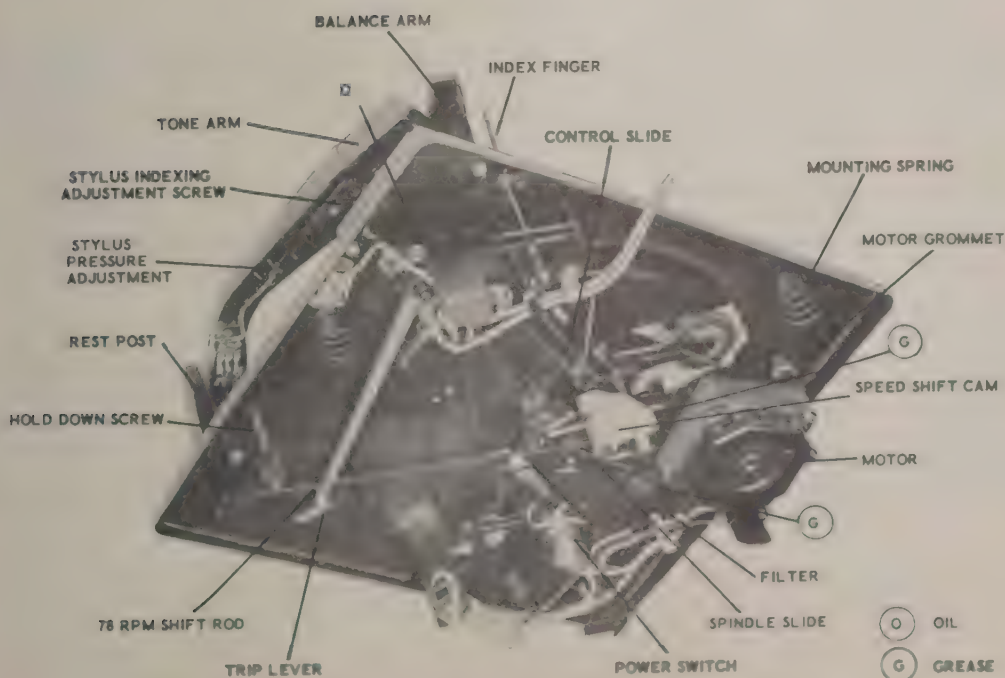


Figure 18

SERVICE NOTES

1. CHANGER DOES NOT FUNCTION WHEN CONTROL IS TURNED TO ON-REJ POSITION.

- A. CAUSE: No power to motor.
REMEDY: (1) Check to see that AC current is reaching motor.
(2) Check wiring connection at switch and motor.
- B. CAUSE: Line voltage too low.
REMEDY: Line voltage must be at least 105 volts.
- C. CAUSE: Cycle of mechanism not complete.
REMEDY: Remove snap ring that secures turntable on record spindle. Remove turntable by lifting it straight up. Turn main gear until crank pin is in notch in slide.
- D. CAUSE: Foreign lubricant on rubber tire (single tire wheel) that cycles changer.
REMEDY: Remove turntable and clean tire with lint free cloth moistened with alcohol. Also clean motor shaft, idler wheels and inside of turntable rim.
- E. CAUSE: Pinion-driver jammed between motor pulley and main gear.
REMEDY: Manually rotate main gear in counterclockwise direction.

2. ON-OFF CONTROL CANNOT BE TURNED TO ON-REJ POSITION.

- A. CAUSE: Cycle of mechanism not complete.
REMEDY: (Follow same procedure as given in Section 1-C.)

3. CHANGER WILL CYCLE AND TONE ARM WILL COME INTO PLAYING POSITION BUT TURNTABLE WILL NOT OPERATE.

- A. CAUSE: Turntable idler wheel (wheel with 2 tires) not engaging motor shaft and turntable.
REMEDY: Check spring on arm that supports idler to be certain that idler is being pulled toward the motor shaft.
- B. CAUSE: (When switching speeds manually only.) Excessive friction between cam and pin that raises and lowers idler arm.
REMEDY: Lubricate the top surfaces of steps on cam (operated by speed change knob) that raises and lowers idler arm.

4. TURNTABLE SPEED TOO SLOW OR LARGE VARIATIONS IN TURNTABLE SPEED.

- A. CAUSE: Improper line voltage.
REMEDY: Line voltage should be between 105 and 130 volts.
- B. CAUSE: Oil or grease on turntable idler, motor shaft, or turntable.
REMEDY: Wash all surfaces that contact each other, with alcohol. Be sure to wash all diameters on motor shaft.

C. CAUSE: Binding in turntable.

REMEDY: (1) With changer shut off check freedom of turntable rotation by spinning it by hand. Turntable must coast freely for a considerable length of time. If binding or roughness occurs, remove turntable and clean bushing and spindle surfaces and relubricate with light oil.

(2) Check turntable thrust bearing for any foreign matter, clean and relubricate with "Vaseline" or grease supplied with kit.

D. CAUSE: Misalignment between turntable idler and diameter on motor shaft pulley.
REMEDY: Check alignment of turntable idler and pulley diameters on motor shaft. Starting with the 78 rpm position (largest diameter on motor pulley) and switching speeds from 78 to 16 rpm, the idler must raise and contact the respective diameters on the motor without touching any of the diameters below. If idler arm is bent (should be parallel to motor plate), straighten arm until alignment above is achieved.

5. DIFFICULTY IN CHANGING SPEEDS MANUALLY.

A. CAUSE: Motor and switch wiring interfering with speed change wire link.
REMEDY: Move all wires so that wire link is not restricted by them in any speed position.

b. CAUSE: Idler arm badly bent.
REMEDY: (See procedure outlined under section 4-D.)

C. CAUSE: Crank on speed knob shaft interfering with motor board.
REMEDY: Check mounting of changer on motor board, making certain that the mounting springs are properly seated in the holes provided.

6. TURNTABLE DOES NOT TURN AT 78 RPM WITH SPEED KNOB IN "SPEEDMINDER" POSITION AND 78 RPM WAND IN PLACE ON CARTRIDGE BRACKET.

A. CAUSE: 78 rpm shift wand is not moving pivot blade in rest post far enough to set the mechanism for 78 speed.

REMEDY: (1) Make sure the lever can enter the hole in the rest post without any interference.

(2) Loosen screw under main base and move rest post toward turntable slightly, to obtain more motion of pivot blade.

7. CHANGER WILL NOT CYCLE WHEN A RECORD IS FINISHED PLAYING (WITH BALANCE ARM OVER SPINDLE.)

A. CAUSE: Velocity trip lever (long narrow lever below changer that moves with the tone arm) is not reaching trip cam.

REMEDY: (1) Check to see that none of the power or cartridge leads are restricting the motion of the trip lever.

(2) The trip lever is bent either too high or too low. The correct level of the free end should be in a range from 1/8" to 1/4" above the motor plate.

8. CHANGER CYCLES WHEN OPERATED IN MANUAL POSITION.

- A. CAUSE: Velocity trip is not being blocked by lever located near the lower bearing hole of the balance arm shaft. This lever should be under spring pressure against the balance arm shaft.
REMEDY: Refasten spring between lever and vertical side of large bracket.

9. TONE ARM DOES NOT LAND AT THE BEGINNING (LEAD-IN GROOVES) OF 7, 10, 12 INCH RECORDS (SET-DOWN ADJUSTMENT).

- A. CAUSE: Improper adjustment.
REMEDY: The set-down adjustment screw is located under the rear of the tone arm. It can be readily identified by the coil spring that surrounds it. Adjust so that stylus lands approximately midway in the margin found at the beginning of all records.

10. TONE ARM DOES NOT DROP SUFFICIENTLY TO PLAY FIRST RECORD OR TONE ARM INTERFERES DURING CYCLING WITH RECORDS LOADED ON SPINDLE.

- A. CAUSE: Improper height adjustment.
REMEDY: The height adjustment screw is located in the bracket that mounts the tone arm. It is located midway between the two screws that secure the arm. One complete turn in a clockwise direction facing the screw head lowers the tone arm approximately 1/8". Tone arm height should be set so that the top of tone arm (or knob of cartridge bracket) clears the lower record on the spindle shaft, and the lower edge of tone arm clears the rest post.

11. TONE ARM WILL NOT LEAVE REST POST DURING CYCLE AND CHANGER SHUTS OFF.

- A. CAUSE: Improper height adjustment.
REMEDY: (See procedure under Section 10.)
B. CAUSE: Improper set-down adjustment.
REMEDY: (See procedure under Section 9.)
C. CAUSE: Balance arm down at spindle (no records on spindle).
REMEDY: Raise balance arm and swing over rest post (or load records on spindle).

12. CHANGER WILL SHUT OFF AFTER EVERY CYCLE WITH BALANCE ARM UP.

- A. CAUSE: Switch lever assembly that operates power switch fails to fall to its downward position.
REMEDY: Clean shaft and bearing of switch lever assembly of any foreign material. Wipe dry of any lubricant. Do not oil.
B. CAUSE: Tone arm does not leave rest post.
REMEDY: (See procedure under Section 11.)

13. CHANGER WILL NOT SHUT OFF AUTOMATICALLY AFTER PLAYING LAST RECORD.

- A. CAUSE: Balance arm does not move to its full downward position.
REMEDY: (1) Clean balance arm shaft and bearing holes of any foreign matter and lubricate with light oil. Arm must be free enough to fall downward by gravity.

(2) Clear any lead wires that may be interfering with the lower end of the balance arm shaft.

- B. CAUSE: Balance arm does not push shut-off wire down when it falls.
REMEDY: Look under changer at lower end of balance arm shaft. Large retaining ring must be in place. Shut-off wire must be below this ring and in contact with shaft.
- C. CAUSE: Tone arm index ratchet does not catch pawl at rest post position. (Tone arm will not stay on rest post.)
REMEDY: Loosen rest post screw below base plate and move post away from turntable.

14. CHANGER DOES NOT INDEX FOR 10" RECORDS.

- A. CAUSE: Improper interference between 10" record and index finger.
REMEDY: (1) If tone arm comes into 7" position instead of 10", this indicates insufficient interference between record and finger. Turn changer off and place a 10" record on the turntable. Bring the index finger by hand toward the spindle until completely forward. Raise the record along the spindle, keeping it parallel to the turntable. The record should interfere with nose of the index finger by approximately $3/32"$. The finger can be adjusted to this dimension by bending forward in the direction of the record. Do not overbend the $3/32"$ interference required.

(2) If tone arm comes into 12" position instead of 10", interference between record and index finger is too great. Use same procedure as given above, however bend the index finger in the opposite direction away from the record until proper interference is achieved.

15. CHANGER REPEATEDLY INDEXES FOR A 12" RECORD.

- A. CAUSE: Index finger is not coming forward during cycle. Spring on finger below disengaged or too weak.
REMEDY: Refasten spring if disengaged. If not disengaged, stiffen spring by removing coils (two at a time) until finger returns to forward position during cycling time.
- B. CAUSE: Index finger is scraping side of slot in balance arm support.
REMEDY: Bend finger to clear slot.

16. CHANGER DROPS TWO RECORDS AT ONCE.

- A. CAUSE: Center hole in record too large.
REMEDY: Oversize holes will cause two records to fall at once.
- B. CAUSE: Small blade in upper portion of spindle not fully down.
REMEDY: (1) Straighten blade if bent so that it falls freely of its own weight.
(2) If not bent, clean slot and blade of any foreign matter and lubricant that may be present. Do not oil. Blade must fall freely by gravity.

17. EXCESSIVE LOW PITCH NOISE (RUMBLE) OR THUMPING SOUND DURING RECORD PLAY.

- A. CAUSE: Motor restrained from floating freely on rubber mounts.
REMEDY: (1) Check to see that motor is not touching any part of cabinet.
(2) Clear any power leads that may be restricting the floating action of the motor.
- B. CAUSE: Damaged turntable idler.
REMEDY: If surface of rubber tire is not smooth or shows signs of distortion, idler should be replaced.
- C. CAUSE: If power to changer is cut in mid-cycle and changer is left in this manner for any length of time, the rubber tires can develop a flat spot that will cause a thumping sound.
REMEDY: Run changer for at least ten minutes. If thumping does not disappear, replace idler.
- D. CAUSE: Foreign matter on idler rubber tire or idler bearing, or in turntable bearing or bushing.
REMEDY: (See procedure under Section 1-D or 4-D.)
- E. CAUSE: Some portion of tone arm may be touching tone arm mounting bracket, or the sides of pivot bracket.
REMEDY: Bend brackets by hand until arm is floating freely on its grommets.

18. TONE ARM DOES NOT TRACK IN RECORD GROOVES (SKIPS GROOVES).

- A. CAUSE: Worn stylus in cartridge.
REMEDY: Replace.
- B. CAUSE: Improper tracking pressure for cartridge used.
REMEDY: Check tracking pressure for cartridge used and adjust to recommended value.
- C. CAUSE: Changer not level.
REMEDY: Relevel changer.
- D. CAUSE: Cartridge leads interfering with motion of tone arm.
REMEDY: Check to see that ample slack is provided in the tone arm leads so that the entire lateral travel of tone arm is not affected by them.

19. NO SOUND DURING RECORD PLAY.

- A. CAUSE: Defective cartridge.
REMEDY: Replace.
- B. CAUSE: Defective wiring.
REMEDY: Check cartridge leads and audio cord for shorted or open leads.
- C. CAUSE: Loose cartridge terminal clips.
REMEDY: Remove clips from terminal, squeeze slightly together and refasten to cartridge.

- D. CAUSE: Muting switch out of adjustment.
REMEDY: Check to see that switch contact points operated by main slide have sufficient clearance when cycle is complete. If necessary, bend blades until this clearance is obtained. Cycle changer and check to see that contacts are touching after the main slide withdraws.

20. TONE ARM SKATES IN OVER STARTING GROOVES.

- A. CAUSE: Anti-skate device inoperative.
REMEDY: (1) Remove turntable, cycle the changer and check to see that the anti-skate rod moves toward spindle as the main slide moves inward. If not, the rod may need to be bent slightly so that the tab on the main slide catches the rod as the slide moves inward.

(2) Check the anti-skate spring on the turntable hub, to see that it engages the end of the anti-skate rod during the first one or two revolutions of the turntable.

21. TONE ARM GOES TO 10" POSITION WHEN PLAYING 7" RECORDS.

- A. CAUSE: Index finger does not come all the way forward.
REMEDY: Shorten the length (by bending) of the extended end of spring attached to main slide (the end that pushes the index finger back). This will allow the finger to move completely forward before it is caught by the pawl.

22. CHANGER WILL NOT SHUT OFF WHEN TURNING LEVER TO "OFF".

- A. CAUSE: (See procedure under section 13-C.)
REMEDY: (See procedure under Section 13-C.)

B. CAUSE: Hinged wire rod that lifts power switch shut-off lever does not raise the lever high enough or raise it at all.
REMEDY: (1) Unexposed end of rod is under cycle control slide. Remove slide and replace with rod resting on top of slide.

(2) Bend end of shut-off lever (under gear) upwards so that lanced tab on gear will engage the lever.

23. SPINDLE WILL NOT DROP LAST RECORD (OR A RECORD).

- A. CAUSE: Balance arm not holding records parallel to turntable.
REMEDY: Twist or bend the balance arm slightly in the required direction so that the records are supported parallel to the turntable.

B. CAUSE: Record release levers of spindle not retracting within the spindle diameter.
REMEDY: Hold ends of levers under motor base, and bend these levers back so they fall inside the diameter of the top portion of spindle and clear the shelf.

24. ERRATIC INDEXING.

- A. CAUSE: Tone arm pivot is loose.
REMEDY: Loosen nut, tighten screw gently then back off 1/8 turn and tighten nut. Be sure point of screw is in socket of pin and that point on opposite end of pin is in hole of bracket. Do not overtighten as this will cause excessive vertical friction. When properly adjusted, the vertical friction is less than 1/2 gram.

25. MOTOR "SQUEALS" OR "GRINDS".

- A. CAUSE: The self-aligning bearings have become misaligned during shipment.
 REMEDY: Apply power to the motor and, while it is running, tap the motor laminations on all sides with a screwdriver handle or small hammer. This will realign the bearings and eliminate the trouble.

SERVICE INFORMATION

SERVICE

If, after applying the information contained in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under "IN CASE OF DIFFICULTY." Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under "IN CASE OF DIFFICULTY." Be as specific as possible and include voltage readings if test equipment is available.

4. Identify the kit model number and date of purchase, if available.
5. Print or type your name and address, preferably in two places on the letter.

With the above information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. He will make no incorrect assumptions nor waste time checking files for the correct spelling of name and address. (The automatic letter opener sometimes cuts through the letter, hence the suggestion to print the name and address twice.) In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed instrument (including all connecting cables) to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a fixed fee of \$6.00, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT equipment. Although you may find charges for local service somewhat higher than those listed in HEATHKIT manuals (for factory service), the amount of increase is usually offset by the transportation charge you would pay if you elected to return your kit to the Heath Company.

HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

- A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.
- B. Identify the type and model number of kit in which it is used.
- C. Mention date of purchase.
- D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that you should find it necessary to return the completed record changer to the Heath Company for repair, every effort must be made in packing the unit to minimize the possibility of damage during shipment.

Before returning the changer for service, be sure that all parts are securely mounted.

ATTACH A TAG TO THE INSTRUMENT GIVING NAME, ADDRESS AND TROUBLE EXPERIENCED.

Remove the balance arm from the changer. Leave the changer in a wood base. Back out the hold-down screws until the changer main base is clamped securely to the wood base. Secure the tone arm solidly to the rest post with rubber bands, or soft string. Pack in a rugged container, preferably wood, using at

least three inches of shredded newspaper or excelsior on all sides. DO NOT SHIP IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT. Wrap the balance arm in newspaper and pack it on top of the changer. Shape a strip of cardboard into a square large enough to fit around the changer metal base; the top edge of the cardboard should be at least two inches higher than the top of the spindle. Finish the packaging by filling the vacant areas

with excelsior or newspaper. Be sure to close the pack securely.

Ship by prepaid express if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.

Portions of this manual have been reproduced from information supplied to Heath Company by the manufacturer of parts included in the kit.

WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

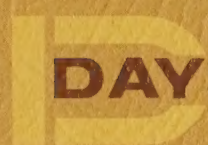
SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.

Antenna General		Resistor General		Neon Bulb		Receptacle two-conductor	
Loop		Resistor Tapped		Illuminating Lamp		Battery	
Ground		Resistor Variable		Switch Single pole Single throw		Fuse	
Inductor General		Potentiometer		Switch double pole single throw		Piezoelectric Crystal	
Air core Transformer General		Thermistor		Switch Triple pole Double throw		1000 =	K
Adjustable Powdered Iron Core		Jack two conductor		Switch Multipoint or Rotary		1,000,000 =	M
Magnetic Core Variable Coupling		Jack three conductor		Speaker		OHM =	Ω
Iron Core Transformer		Wires connected		Rectifier		Microfarad =	MF
Capacitor General		Wires Crossing but not connected		Microphone		Micro Microfarad =	MMF
Capacitor Electrolytic		A. Ammeter V. Voltmeter				Binding post Terminal strip	
Capacitor Variable		G. Galvanometer MA. Milliammeter uA. Microammeter, etc.				Wiring between like letters is understood	 → X Y X Y X → Y

HEATH COMPANY

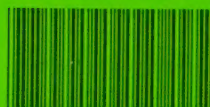
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